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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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30973	7590	11/28/2005	EXAMINER	
SCHEEF & STONE, L.L.P. 5956 SHERRY LANE SUITE 1400 DALLAS, TX 75225			CORRIELUS, JEAN B	
			ART UNIT	PAPER NUMBER
			2637	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/080,933	Applicant(s) ZHANG ET AL.	
	Examiner Jean B. Corrielus	Art Unit 2637	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 February 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>9/26/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: page 12, line 6, "filteringoperations" should be "filtering operations". Page 15, "equlier" should be "equalizer".

Appropriate correction is required.

Drawings

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "88 " and "56" have both been used to designate a filter. The quality of the drawing filed on 02/22/02 is poor. In addition, the drawing must show every feature of the claimed invention, therefore the second processing element the second feedback filter and the second feedforward filter, as recited in the claimed must be shown or the feature canceled from the claims. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

3. Claims 5-10 and 14-16 are objected to because of the following informalities:

Claim 5, line 8, "feedforward" should be "feedback".

Claim 6, line 2, "received" should be "receive".

Claim 7, line 3, "form" should be "forms".

Claim 8, line 2, "form" should be "forms".

Claim 14, line 1, after "the"; "further" should be deleted. The same comment applies to claim 15, line 2.

Claims 9, 10 and 16 are likewise objected because of their dependency to an objected claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 17-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 17, line 5 recites "said method" however, it is unclear as to whether said method refers to "the method of communicating" recited in line 1 or "the method for operating" recited in line 4.

Claim 18, line 3, the limitation "the sending station" lacks of proper antecedent basis.

Note that claim 19 and 20 are likewise rejected because of their being dependent on a rejected claim.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1, 2, 4, 6, and 17 are rejected under 35 U.S.C. 102(e) as being anticipated by Al-Dhahir et al US Patent No. 6,870,882.

As per claim 1, Al-Dhahir et al teaches a MIMO communication system see fig. 1 having a receiving station (see fig. 1) that receives at least a first data vector transmitted thereto upon a communication channel (see fig. 1), the at least the first data vector formed of received symbols see col. 4, lines 18-19, an improvement of apparatus for operating upon the data vector, once received at the receiving station (fig. 1), said apparatus comprising: at least a first processing element 22 coupled to receive indications of the at least the first data vector received at the receiving station (see fig. 1), said first processing element (22) for forming optimized feedforward filter

parameters and optimized feedback filter parameters (see outputs of processor 22) , the optimized feedforward and feedback filter parameters (outputs of processor 22) used to perform interference cancellation and prefilter operations at the receiving station in filters 23 and 26 (see abstract).

As per claim 2, Al-Dhahir et al further teaches further teaches that the receiving station (fig. 1) further comprises at least a first feedforward filter 23 coupled to receive indications of the at least the first data vector, wherein said first processing element 22 is coupled to the first feedforward filter 23, and wherein the optimized feedforward filter parameters formed by said first processing element 22 are provided to the first feedforward filter 23, values of the optimized feedforward parameters (see output of processor 22) used at the first feedforward filter 23 to define filter characteristics of the first feedforward filter 23 and feedforward filtering operations performed upon the indications of the first data vector see inputs of filter 23.

As per claim 4, Al-Dhahir et al further teaches the receiving station (fig. 1) further comprises at least a first feedback filter 26 coupled to receive indications of the at least the first data vector (output of filter 23), wherein said first processing element 22 is coupled to the first feedback filter 26, and wherein the optimized feedback filter parameters formed by said first processing element 22 are provided to the first feedback filter 26, values of the optimized feedback parameters used at the first feedback filter (26) to define filter characteristics thereof.

As per claim 6, the receiving station (Fig. 1) further comprises a feedforward filter 23 coupled to receive values representative of the first data vector (see output of

sampler 20) said first processing element 22 is coupled to the first feedforward filter 23 and wherein the optimized feedforward filter parameters formed by said first processing element 22 are provided to the first feedforward filter 23, values of the optimized feedforward parameters used at the first feedforward filter 23 to define filter characteristics of the first feedforward filter 23, the first feedforward filter 23 forming a first feedforward-filtered signal (see output of filter 23) , the first feedforward-filtered signal (output of filter 23) forming the indications of the at least the first data vector (output of sampler 20).

As per claim 17, see claim 1.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 3, 5, 11, 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Dhahir et al in view of Ishikawa et al.

As per claim 3, as applied to claim 1 above, Al-Dhahir et al teaches every feature of the claimed invention. In addition, it teaches the feedforward filter includes a first filter and a second filter see fig. 2. However, it fails to teach a second processing element coupled to the second filter to receive optimized feedforward parameters. It only teaches that the processor 22 is configured to provide optimized feedforward

parameters to the second filter. Ishikawa et al teaches a second processing element 201 to generate output signal (optimized feedforward parameters) to the second filter 37. However, modifying Al-Dhahir et al by incorporating a second processor to generate optimized feedforward parameters to the second filter as suggested by Ishikawa et al would have been obvious to one skill in the art so as to satisfy system design requirements. In addition, such modification would have enhanced signal processing speed since the load of the single processor would have been shared between two processors.

As per claim 5, the at least one data vector includes a first data vector and a second data vector (see output of sampler 20). Al-Dhahir et al further teaches that the at least the first feedback filter comprises a first feedback filter and at least a second feedback filter see fig. 2. However, it fails to teach a second processing element coupled to the second filter to receive optimized feedback parameters. It only teaches that the processor 22 is configured to provide optimized feedback parameters to the second filter. Ishikawa et al teaches a second processing element 201 coupled to the second filter 43 to receive a signal (optimized feedback parameters). However, modifying Al-Dhahir et al by incorporating a second processor to generate optimized feedback parameters to the second filter as suggested by Ishikawa et al would have been obvious to one skill in the art and the motivation to do so would have been the same as provided I reference to claim 3 above.

As per claim 11, Al-Dhahir et al teaches every feature of the claimed invention and in addition it further teaches a plurality of antenna elements 21 and it fails however

to teach a plurality of processing elements corresponding in number with the plurality of antenna. It only shows one processing element coupled to the plurality of antennas.

Ishikawa et al teaches a plurality of processing elements ((101) and (201)) corresponding in number with the plurality of antennas (11 and 21). However, modifying Al-Dhahir et al in such a way as to provide the same number of antennas as the number of processing elements as taught by Ishikawa would have been obvious to one skill in the art and the motivation to do so would have been the same as provided in claim 3 above.

As per claim 12, Ishikawa et al teaches the same number of receive-chain portions ((12, 14) and (22, 24)) as the number of processing elements (101 and 201). It would have been obvious to one skill in the art to provide the same number of receive-chain portions as the number of processing elements as taught by Ishikawa et al and the motivation to do so would have been the same as provided in reference to claim 3 above.

10. Claims 7- 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Dhahir et al in view of Malkemes et al US Application S/N 2002/0106040 A1.

As per claim 7, as applied to claim 4, Al-Dhahir et al teaches every feature of the claimed invention but does not explicitly teach the receiving station further comprises a sequence estimator and wherein the first feedback filter to which the optimized feedback parameters formed by said first processing element are provided form part of the sequence estimator. Malkemes et al teaches a sequence estimator (fig. 3) and a

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feedback filter 306 forming part of the sequence estimator (fig. 3). Given that fact it would have been obvious to one skill in the art to modify Al-Dhahir in such a way as to provide the feedback filter as part of a sequence estimator as suggested by Malkemes et al in order to improve prediction of received symbols as taught by Malkemes see paragraph 0019.

As per claim 8, Al-Dhahir et al fail to teach that the feedforward filter form part of a sequence estimator. Malkemes teaches in fig. 3 that the feedforward filter forms part of a sequence estimator see fig. 3. Given that fact, it would have been obvious to one skill in the art to modify Al-Dhahir et al in such a way as to include the feedforward filter as part of the sequence estimator and the motivation to do so would have been the same as provided in reference to claim 7.

As per claim 9, it would have been obvious to one skill in the art to modify Al-Dhahir et al in such a way that concurrent interference cancellation and prefilter operations are performed at the sequence estimator and the motivation to do so would have been the same as provided in reference to claim 7.

As per claim 10, Malkemes teaches the sequence estimator (fig. 3) comprises a DFSE having a MLSE to which the feedback filter is connected in a feed back arrangement see fig 3. Given that fact it would have been obvious to one skill in the art to incorporate such a teaching in Al-Dhahir et al and the motivation to do so would have been the same as provided in reference to claim 7.

11. Claims 13-16, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Dhahir et al in view of Dent US Patent No. 6,934,317.

As per claim 13, as applied to claim 1 above, Al-Dhahir et al teaches every feature of the claimed invention but does not explicitly teach a joint encoder for encoding jointly a first and second data. Dent teaches a joint encoder 1310 (fig. 13) for encoding jointly a first and second data. Given that fact it would have been obvious to one skill in the art to incorporate such a teaching in Al-Dhahir et al in order to minimize system configuration and/or cost since one encoder would have been used rather than two encoders for respective signal stream.

As per claim 14, it is well known in the art to puncture decoded signal prior for any transmission. Given that, it would have been obvious to one skill in the art to puncture the encoded signal prior to transmission in order to increase transmission rate since less data would have been transmitted.

As per claim 15, note that Dent teaches that the encoder includes an interleaver see col. 20, line 49. It would have been obvious to incorporate such a teaching in Al-Dhahir et al in order to minimize error during reconstruction of the signal.

As per claim 16, Dent further teaches a joint decoder 1940 (fig. 19) for reconstructing the received signal. Given that fact, it would have been obvious to one skill in the art to incorporate such a teaching in Al-Dhahir et al and the motivation to do so would have been the same as in claim 13.

As per claim 18, see claim 13.

As per claim 19, see claim 16.

12. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Dhahir et al in view of Dent US Patent No. 6,934,317 and further in view of Malkemes et al US Application S/N 2002/0106040 A1.


As applied to claim 19 above, Al-Dhahir et al and Dent teaches the invention substantially as claimed but does not explicitly teach the receiving station further comprises a sequence estimator to perform concurrently the interference cancellation and prefiltering operations. Malkemes et al teaches a sequence estimator (fig. 3) to perform concurrently the interference cancellation and prefiltering operations (fig. 3). Given that fact, it would have been obvious to one skill in the art to modify Al-Dhahir and Dent in such a way as to perform concurrently the interference cancellation and prefiltering operations in a sequence estimator in order to improve prediction of received symbols as taught by Malkemes see paragraph 0019.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jean B. Corrielus whose telephone number is 571-272-3020. The examiner can normally be reached on Maxi-Flex.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jay Patel can be reached on 571-272-2988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Jean B Corrielus
Primary Examiner
Art Unit 2637

11-23-05